A5200-4.10

Insurance Losses, Theft Coverages

A Comparison of the Theft Loss Experience of General Motors Passenger Cars With and Without Factory-Installed Theft Deterrent Systems

1980-1981 Models

Research Report HLDI A-19
January 1983

Highway Loss Data Institute
Watergate Six Hundred
Washington, D.C. 20037

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Summary

This Highway Loss Data Institute report compares the insurance theft loss experience of 1980 and 1981 model year General Motors cars equipped with factory-installed theft deterrent systems to comparable models without this option that were garaged in the same geographic areas.

Principal Findings:

- 1980 and 1981 model year Buicks, Oldsmobiles, and Cadillacs equipped with factory-installed theft deterrent systems had better theft loss results than the same models without the option garaged in the same geographic area.*
- The theft claim frequency was 21 percent lower, the average loss payment per claim 11 percent lower, and the average loss payment per insured vehicle year 30 percent lower for the cars with the factory-installed theft deterrent system compared to the same models without the option.

* It should be noted that these results only apply to the GM factory-installed theft deterrent system. It is impossible to extrapolate from these results to other theft deterrent devices and approaches, which employ a variety of methods to reduce theft.

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Introduction

The Highway Loss Data Institute (HLDI) is a non-profit public service organization that gathers, processes, analyzes, and publishes insurance data concerned with human and economic losses associated with motor vehicle use and especially the ways such losses vary among different kinds of vehicles.

Since 1979 HLDI has been publishing results on the theft loss experience of vehicles insured under comprehensive coverages. The results published since that time indicate that certain vehicles consistently have larger than average theft losses.

As a way of possibly reducing the incidence of car theft, GM has offered a factory-installed theft deterrent system on various models since 1968. The type of system, its implementation, and its method of operation have changed over the years. The system currently available (1983 model year) was introduced at the beginning of the 1980 model year as an option on some Buick, Oldsmobile, and Cadillac models equipped with power door locks. Since the start of the 1981 model year, the same system has been standard on all Corvette models, although its installation differs in several respects.

The system on the vehicles in this study is designed to detect various methods of unauthorized entry into both the passenger compartment and trunk. Once detected, the system activates an alarm and simultaneously disables the starter circuit, which prevents the vehicle from being started. In addition, a security light on the instrument panel provides certain information about the status of the system.

The system is armed with the ignition switch off and the door open by moving one of the power door lock switches to its "locked" position. At this point, the amber security system light will be constantly illuminated rather than flashing as it does each time the door is open with the ignition off. Shortly after the last open door is closed, the security system light will go out indicating the system is fully armed. The system is disarmed by unlocking either front door with the key.

Tampering with the door or trunk locks or opening a door(s) after activation of a door lock without a key will trigger the theft deterrent system. At that time, the horn sounds intermittently, exterior lights flash, and the vehicle cannot be started. The horn will continue to sound and the lights flash for up to seven minutes. Then these warnings will cease as a means of conserving power. They will be reactivated if there is another improper entry. The starting function, however, once interrupted, remains disabled until the system is properly deactivated using the key to unlock one of the doors.

This report compares the theft loss experience under comprehensive coverages of three makes of General Motors vehicles with and without the current factory-installed theft deterrent system. The specific models whose theft loss results are included in this study are the Buick Electra, LeSabre, and Riviera, Oldsmobile Delta 88, Ninety-Eight, and Toronado, Cadillac Brougham, DeVille, Eldorado, and Seville. Since virtually all of the vehicles used in this study, whether or not they were equipped with the theft deterrent system, were sold with power door locks, any differences in the theft loss experience of the two groups cannot be attributed to the ease of locking cars with power door locks. Results are presented for 1981 model year Buicks, Oldsmobiles, and Cadillacs during their first year of availability and the same 1980 makes during their first two years of availability. The report was made possible by the cooperation of General Motors, which supplied HLDI with the vehicle identification numbers of its 1980 and 1981 cars sold with the factory-installed theft deterrent system. It is also based on comprehensive coverage and theft loss data supplied by nine insurers: Aetna, Allstate, GEICO, Kemper, Liberty Mutual, Nationwide, Prudential, State Farm, and Travelers.

There are considerable geographic variations in theft loss experience. Vehicles garaged in some areas are more likely to incur a theft loss than vehicles garaged in other areas. Since it is probable that the theft deterrent option is more likely to be purchased in areas with high theft losses, the analysis method used ensured that the garaging locations of the cars did not distort the comparisons. In the study, each car equipped with a factory-installed theft deterrent system was matched by garaging location with a car of the same make and series that did not have the option. In this way, the comparisons between the two groups of cars were not distorted by geographic effects. Although pairs

of cars were matched by geographic location, the exposure periods for the pairs of cars were only approximately matched. Consequently, the total exposure for the compared sets of cars is not identical. The details of this matching by garaging location are given in Appendix A, Methods of Data Analysis.

Previous HLDI studies of comprehensive theft losses have shown that claim frequencies and average loss payments per claim are influenced by the proportion of youthful operators and by the deductible amount. However, for the sets of cars compared in this study, the distributions of youthful operators and deductibles were nearly identical and it is unlikely that these factors could have distorted the comparisons.

The results presented in this report include the complete spectrum of theft losses occurring under comprehensive coverages, ranging from the theft of items from the vehicle (parts and/or contents) to the theft of the vehicle itself. Thus, losses a theft deterrent system may not deter, such as the theft of exterior components (e.g., tires, wheels, mirrors, etc.) or losses incurred by forced entry through glass areas (i.e., windshield, side, or rear windows) are included. On the other hand, thefts of certain electronic items generally not covered by comprehensive insurance, such as tape decks and citizen band radios, are not included in the results.

It is intended that the dissemination of this and other HLDI reports will contribute to research into ways for reducing vehicle-related damage to people and property, as well as providing the public with information illustrating the variations in the insurance loss experience of different kinds of vehicles.

Results and Discussion

This report compares the overall claim frequency, average loss payment per claim, and average loss payment per insured vehicle year for 1980 and 1981 model year General Motors cars with and without the factory-installed theft deterrent system. The results presented in this report are based on the theft loss experience of only those models of Buick, Oldsmobile, and Cadillac cars for which the theft deterrent system was available as optional original equipment.

Table 1 and Figures 1-3 illustrate the comparative theft loss experience of 1980 and 1981 model year Buick, Oldsmobile, and Cadillac models with and without the theft deterrent system. As Figure 1 shows, cars with the theft deterrent system had lower claim frequencies than those without the option. Theft claim frequencies for cars with the factory-installed theft deterrent option were 15 to 24 percent lower than those for comparable cars without the system. It should be noted that the results shown in Table 1 for both the cars with the theft deterrent system and for those without are higher than previously reported results for these models (HLDI Research Report T81-1), suggesting that the cars sold with the theft deterrent system are more likely to be operated in areas with higher than average theft losses.

Figure 2 shows the average loss payments per claim for each make. Cars without the theft deterrent option had higher average theft loss payments per claim than those cars equipped with the system.

Cars equipped with the factory-installed theft deterrent system also had lower average loss payments per insured vehicle year than the cars without the option. Average loss payments per insured vehicle year for cars with the theft deterrent option were 27 to 43 percent lower than those for comparable cars without the theft deterrent system garaged in the same geographic areas.

TABLE 1

Comprehensive Coverages
Theft Loss Experience of 1980-1981 Passenger Cars
With and Without Theft Deterrent Systems

Make	Theft Deterrent System	Total Exposure (Insured Vehicle Years)	Claim Frequency per 1,000 Insured Vehicle Years	Percent Reduction	Average Loss Payment Per Claim	Percent Reduction	Average Loss Payment per Insured Vehicle Year	Percent Reduction
Buicks	No	4014	28.6		3292		94.2	
	Yes	3852	24.4	15	2197	33	53.6	43
Oldsmobiles	No	3480	30.5		1937		59.1	
	Yes	3358	23.2	24	1611	17	37.4	37
Cadillacs	No	14853	38.7		3400		131.6	
	Yes	14941	30.1	22	3185	6	95.9	27
All	No	22346	35.6		3190		113.6	
	Yes	22151	28.1	21	2838	11	79.7	30

These results indicate that the factory-installed theft deterrent system available as an option on certain 1980 and 1981 Buick, Oldsmobile, and Cadillac models substantially reduces insurance theft losses. It should be noted, however, that these results only apply to the GM factory-installed theft deterrent system activated by electrically locking the car doors; it is not possible to extrapolate from these results to other theft deterrent devices and approaches, which employ a variety of methods to reduce theft.

FIGURE 1

Comprehensive Coverages
Theft Claim Frequencies per 1,000 Insured Vehicle Years
1980-1981 Vehicles With and Without
Factory-Installed Theft Deterrent Systems (TDS)

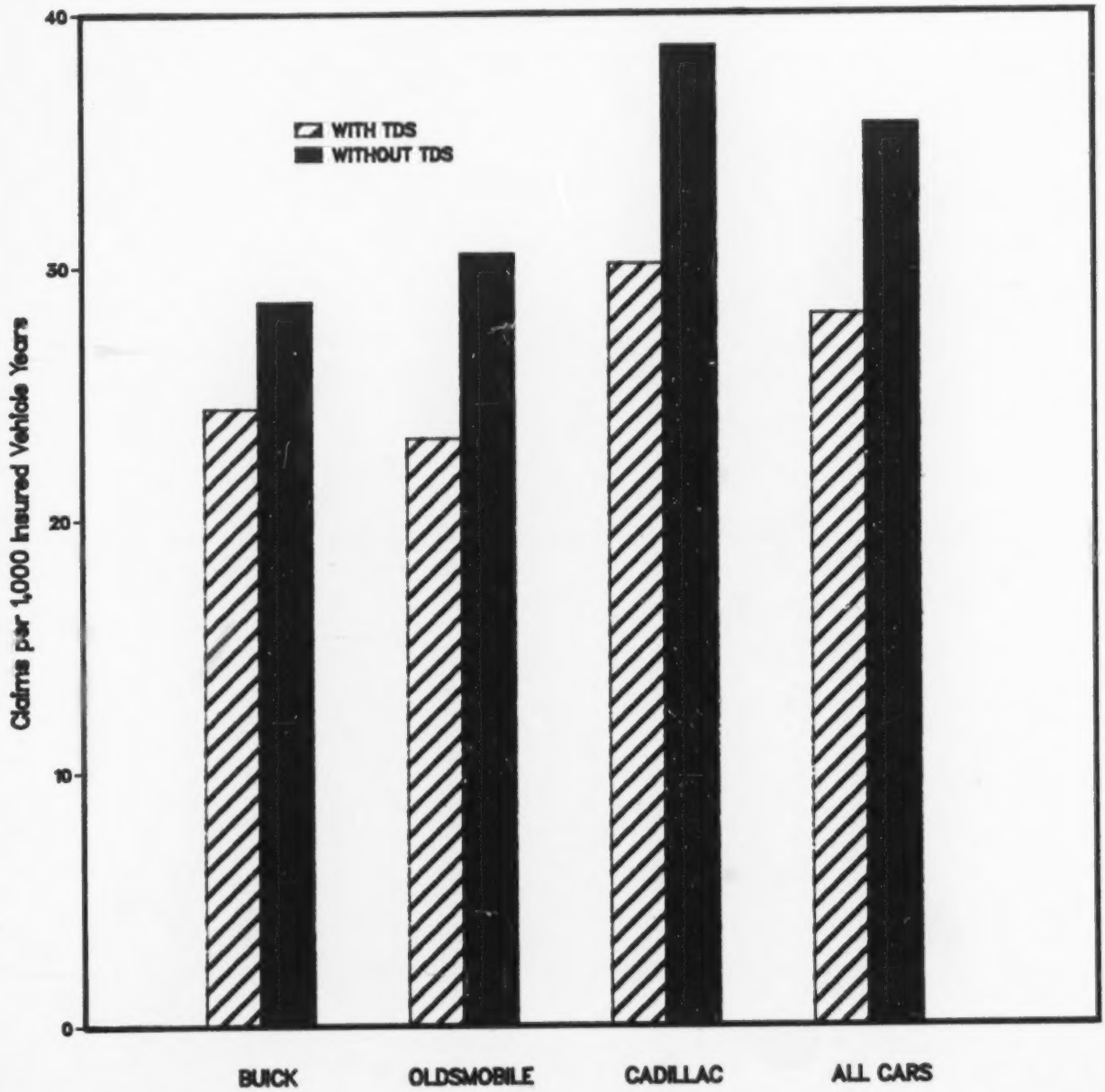


FIGURE 2

Comprehensive Coverages
Average Loss Payments per Claim
1980-1981 Vehicles With and Without
Factory-Installed Theft Deterrent Systems (TDS)

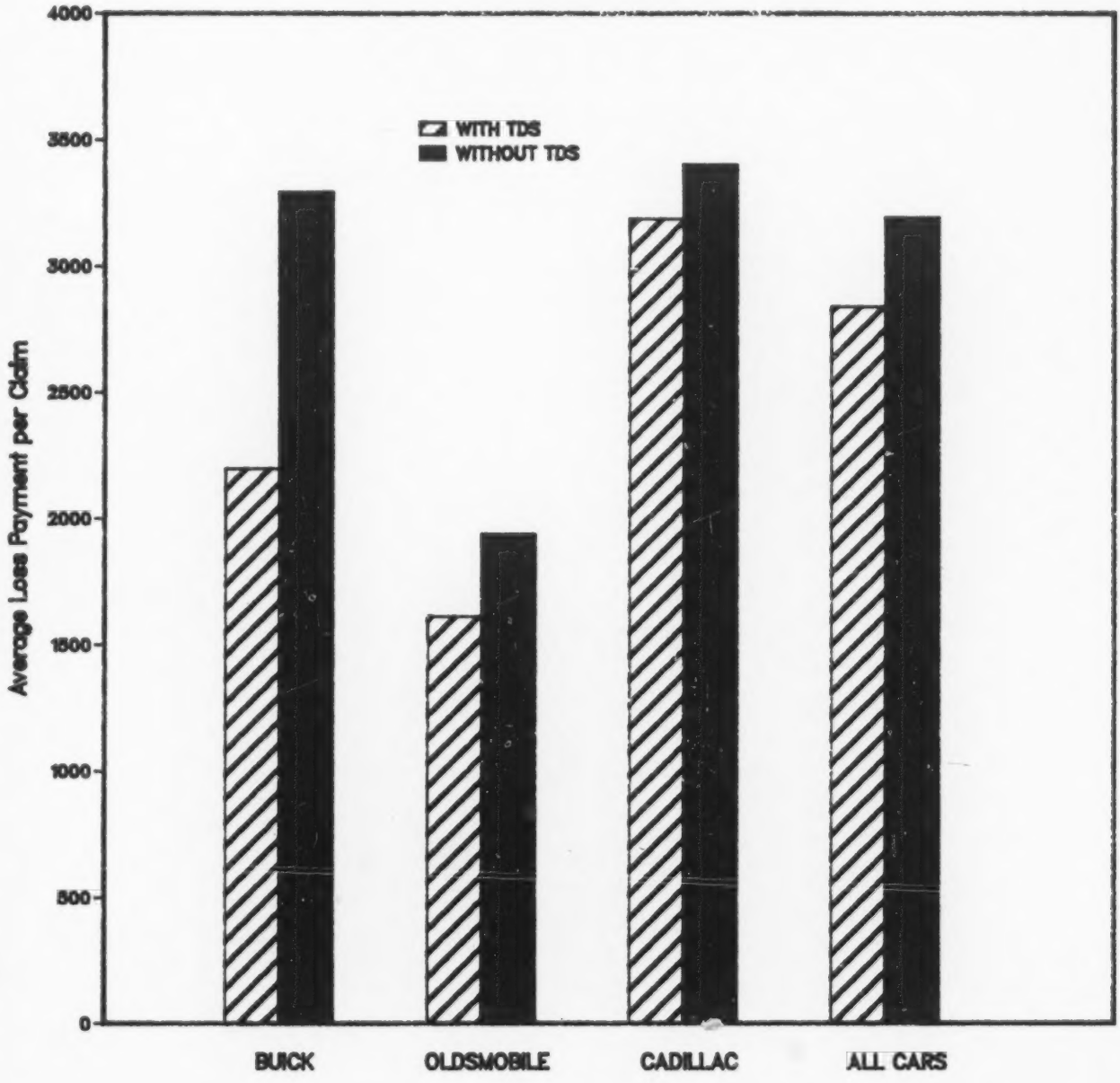
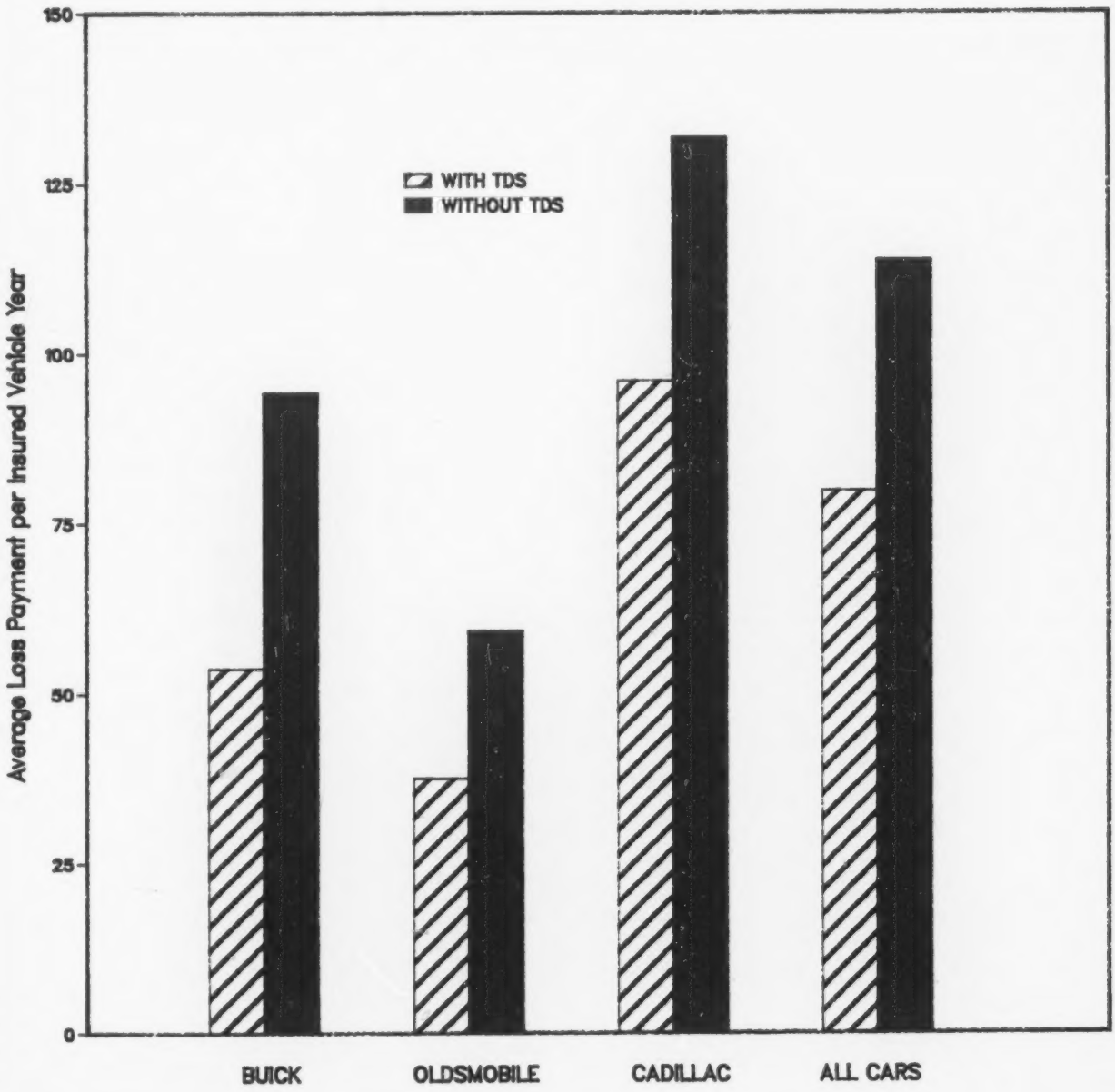


FIGURE 3

Comprehensive Coverages
Average Loss Payments per Insured Vehicle Year
1980-1981 Vehicles With and Without
Factory-Installed Theft Deterrent Systems (TDS)



Appendix A
Methods of Data Analysis

Vehicle Description and Identification

The Vehicle Identification Numbers (VINs) of most new automobiles sold in the United States are individually unique numbers that contain, in coded form, detailed information as to each vehicle's make, series, and other distinguishing characteristics.

General Motors supplied HLDI with the VINs of 1980 and 1981 model year Buicks, Oldsmobiles, and Cadillacs which were sold with factory-installed theft deterrent systems as optional original equipment. The VINs of these cars were then matched against VINs of vehicles in the HLDI data base. Only those cars whose coverage records were in the HLDI data system were used in this study.

Vehicle Matching Procedure

Garaging locations in the HLDI data system are defined in one of two ways, either five-digit ZIP codes or insurance state and territory codes.

For garaging locations defined by ZIP codes, each car with a factory-installed theft deterrent system was matched by five-digit ZIP code with the same make and series without the system. If no match could be found for the five-digit ZIP, a match was attempted at a four-digit ZIP code level. If a match could not be found at that level, a match of ZIP zones — defined as the aggregation of those ZIP codes with identical first three digits — was attempted. The areas encompassed by such aggregations of zip codes are always contiguous.

For state and territory codes, vehicles with factory-installed theft deterrent systems were matched by make and series to models without the option on the basis of shared state and territory garaging locations.

Over 80 percent of the vehicle matches used in this study were made at either the five-digit ZIP code level or the state and territory level, insuring that the compared sets of cars were garaged in very similar geographic locations. Only those cars with theft deterrent systems for which a geographic match could be found were used in the study. There was no way to determine from the data the garaging condition of the cars when not in use, whether, for example, they occupied enclosed garages or used on-street parking.

Appendix B
Definitions

Average Loss Payment per Claim — The total of all loss payments made for the claims for a group of vehicles, divided by the number of claims paid; expressed as dollars per claim.

Average Loss Payment per Insured Vehicle Year — For a group of vehicles, the product of Claim Frequency and Average Loss Payment per Claim, divided by 1,000; expressed as dollars per insured vehicle year. It should be noted that this definition differs from the commmonly used insurance term, pure premium, but yields similar results.

Claim Frequency — The number of claims for a group of vehicles, divided by the exposure for that group; expressed as claims per one thousand insured vehicle years.

Exposure — The time interval an individual vehicle is insured. Exposure for a group of vehicles is expressed in units of insured vehicle years.

Loss Payment — That portion of the theft loss borne by the insurer; in general, the total theft loss minus the deductible amount.

Theft Coverages — The coverage under which people insure their own car against loss caused by partial or total theft.

Vehicle Identification Number (VIN) — A code, variously comprising both numbers and letters; normally 8 to 17 characters in length, assigned to each vehicle by its manufacturer. The VIN uniquely identifies the vehicle within at least a ten-year time span and, in recent model year vehicles, almost always contains coding which identifies the make, series, model year, and other characteristics of each vehicle.

Vehicle Series — A name denoting a family of vehicles, within a make, with the same wheelbase and a degree of commonality in construction, such as body, chassis, etc.

List of Publications

Research reports published by the Highway Loss Data Institute are:

R72-1 *Automobile Insurance Losses, Collision Coverages; Variations by Make and Series, 1972 Models*, June 1973.

R73-1 *Automobile Insurance Losses, Collision Coverages; Initial Results for 1973 Models Compared with 1972 Models*, September 1973.

R73-2 *Automobile Insurance Losses, Collision Coverages; Variations by Make and Series, 1973 Models*, March 1974.

R73-3 *Automobile Insurance Losses, Collision Coverages; Variations by Make and Series, 1973 Models During Their First Two years*, December 1974.

R73-4 *Automobile Insurance Losses, Collision Coverages; Variations by Make and Series, 1973 Models During Their First Three Years*, December 1975.

R74-1 *Automobile Insurance Losses, Collision Coverages; Initial Results for 1974 Models*, May 1974.

R74-2 *Automobile Insurance Losses, Collision Coverages; Variations by Make and Series, 1974 Models During Their First Year*, December 1974.

R74-3 *Automobile Insurance Losses, Collision Coverages; Variations by Make and Series, 1974 Models During Their First Two Years*, December 1975.

R75-1 *Automobile Insurance Losses, Collision Coverages, Initial Results for 1975 Models*, July 1975.

R75-2 *Automobile Insurance Losses, Collision Coverages; Variations by Make and Series, 1975 Models During Their First Year*, December 1975.

R76-1 *Automobile Insurance Losses, Collision Coverages; Initial Results for 1976 Models*, June 1976.

R76-2 *Automobile Insurance Losses, Collision Coverages; Variations by Make and Series, 1976 Models During Their First Year, 1975 Models During Their First Two Years, 1974 Models During Their First Three Years*, December 1976.

R77-1 *Automobile Insurance Losses, Collision Coverages; Initial Results for 1977 Models*, June 1977.

R77-2 *Automobile Insurance Losses, Collision Coverages; Variations by Make and Series, 1977 Models During Their First Year, 1976 Models During Their First Two Years, 1975 Models During Their First Three Years*, December 1977.

R78-1 *Automobile Insurance Losses, Collision Coverages; Initial Results for 1978 Models*, June 1978.

R78-2 *Automobile Insurance Losses, Collision Coverages; Variations by Make and Series, 1978 Models During Their First Year, 1977 Models During Their First Two Years, 1976 Models During Their First Three Years*, January 1979.

R79-1 *Automobile Insurance Losses, Collision Coverages; Initial Results for 1979 Models*, June 1979.

R79-2 *Automobile Insurance Losses, Collision Coverages, Variations by Make and Series, 1979 Models During Their First Year, 1978 Models During Their First Two Years, 1977 Models During Their First Three Years*, December 1979.

R80-1 *Automobile Insurance Losses, Collision Coverages; Initial Results for 1980 Models*, June 1980.

R80-2 *Automobile Insurance Losses, Collision Coverages; Variations by Make and Series, 1980 Models During Their First Year, 1979 Models During Their First Two Years, 1978 Models During Their First Three Years*, December 1980.

R81-1 *Automobile Insurance Losses, Collision Coverages; Initial Results for 1981 Models*, July 1981.

R81-2 *Insurance Losses, Collision Coverages; Passenger Cars, Vans, Pickups, and Utility Vehicles; 1981 Models During Their First Year, 1980 Models During Their First Two Years, 1979 Models During Their First Three Years*, December 1981.

R82-1 *Automobile Insurance Losses, Collision Coverages; Initial Results for 1982 Models*, July 1982.

R82-2 *Insurance Losses, Collision Coverages; Passenger Cars, Vans, Pickups, and Utility Vehicles; 1982 Models During Their First Year, 1981 Models During Their First Two Years; 1980 Models During Their First Three Years*, December 1982.

V78-1 *Automobile Insurance Losses, Non-Commercial Collision Coverages; Variations by Make and Series, Vans, Pickups and Utility Vehicles; 1978 Models During Their First Year, 1977 Models During Their First Two Years*, February 1979.

V79-1 *Automobile Insurance Losses, Non-Commercial Collisions Coverages; Variations by Make and Series, Vans, Pickups and Utility Vehicles; 1979 Models During Their First Year, 1978 Models During Their First Two years*, April 1980.

V79-2 *Automobile Insurance Losses, Personal Injury Protection Coverages; Claim Frequency Results by Size of Claim for 1977, 1978, and 1979 Vans, Pickup Trucks, and Utility Vehicles,* October 1980.

V79-3 *Insurance Theft Losses; Vans, Pickups, and Utility Vehicles, 1979 Models,* May 1981.

V80-1 *Automobile Insurance Losses, Non-Commercial Collision Coverages; Variations by Make and Series, Vans, Pickups, and Utility Vehicles; 1980 Models During Their First Year, 1979 Models During Their First Two Years, 1978 Models During Their First Three Years,* December 1980.

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I75-1 *Automobile Insurance Losses, Injury Coverages; Claim Frequency Results for 1974 and 1975 Models,* June 1976.

I75-2 *Automobile Insurance Losses, Percentage of Collision Claims with Associated Injury Claims for 1974 and 1975 Models,* March 1977.

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I76-2 *Automobile Insurance Losses, Injury Coverages; Claim Frequency Results for 1974, 1975, and 1976 Models,* September 1978.

I77-1 *Automobile Insurance Losses, Injury Coverages; Claim Frequency Results for 1977 Models,* September 1978.

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I81-1 *Insurance Losses, Personal Injury Protection Coverages; Passenger Cars, Vans, Pickups, and Utility Vehicles,* September 1982.

A-1 *Automobile Insurance Losses, Collision Coverages; A Comparison of Results for 1972 and 1973 Models,* May 1974.

A-2 *Automobile Insurance Losses, Collision Coverages; Relationships Between Losses and Vehicle Density, 1972 and 1973 Models,* September 1974.

A-3 *Automobile Insurance Losses, Collision Coverages; A Comparison of Results for 1973, 1974 and 1975 Models,* July 1975.

A-4 *Automobile Insurance Losses, Collision Coverages; Relationships Between Losses and Vehicle Density, 1974 and 1975 Models,* December 1975.

A-5 *Automobile Insurance Losses, Collision Coverages; Relationships Between Losses and Vehicle Body Style, 1974 and 1975 Models,* December 1975.

A-6 *Automobile Insurance Losses, Collision Coverages; An Investigation of Relationships Between Losses and Engine Specifications, Using 1973 Models,* June 1976.

A-7 *Automobile Insurance Losses, Collision Coverages; Annual Increases and Seasonal Variations 1972, 1973, 1974 and 1975 Models,* June 1976.

A-8 *Automobile Insurance Losses, Injury Coverages; A Preliminary Comparison of Results for Volkswagen Rabbits with Passive and Active Seat Belts, 1975 and 1976 Models,* June 1977.

A-9 *Automobile Insurance Losses, Collision Coverages; A Comparison of Collision Claim Size Distributions for 1974, 1975, and 1976 Models,* November 1977.

A-10 *Automobile Insurance Losses, Injury Coverages; Comparisons of Claim Frequencies of Volkswagen Rabbits with Automatic and Manual Seat Belts, 1975, 1976, and 1977 Models,* June 1979.

A-11 *Automobile Insurance Losses, Collision Coverages; The Consistency of the Loss Experience of Specific Vehicles Produced in Several Years, 1975 to 1978 Models,* June 1979.

A-12 *Automobile Insurance Losses, Collision Coverages; An Assessment of the Effects of the Federal Safety Bumper Standard on the Losses for 1972 Through 1978 Models,* June 1980.

A-13 *Automobile Insurance Losses, Personal Injury Protection and Collision Coverages; The Effects of Car Size on Crash Losses, 1977-1980 Models,* May 1981.

A-14 *Automobile Insurance Losses, Personal Injury Protection and Collision Coverages; Comparisons of the Loss Experience of Two- and Four-Door Cars, 1978, 1979, and 1980 Models,* June 1981.

A-15 *Automobile Insurance Losses, Personal Injury Protection and Collision Coverages; Relationships Between Injury and Collision Losses and Engine Options for Selected 1977-1979 Compact Cars,* June 1981.

A-16 *Automobile Insurance Losses, Collision Coverages; The Frequency of Claims Involving Salvage; Subcompact and Compact Cars; 1980 Models,* January 1982.

A-17 *Insurance Losses, Comprehensive Coverages; Non-Crash Fire Losses; 1979-1980 Models,* February 1982.

A-18 *Insurance Losses, Theft Coverages; The Distribution of Theft Loss Payment Amounts; Passenger Cars, Vans Pickups, and Utility Vehicles; 1981 Models During Their First Year, 1980 Models During Their First Two Years; 1979 Models During Their First Three Years,* June 1982.

A-19 *Insurance Losses, Theft Coverages; A Comparison of the Theft Loss Experience of General Motors Passenger Cars With and Without Factory-Installed Theft Deterrent Systems; 1980-1981 Models,* January 1983.

T79-1 *Automobile Insurance Theft Losses by Make and Series; 1979 Models,* June 1980.

T80-1 *Automobile Insurance Theft Losses by Make and Series; 1979 and 1980 Models,* April 1981.

T81-1 *Insurance Losses, Theft Coverages; Passenger Cars, Vans, Pickups, and Utility Vehicles; 1981 Models During Their First Year, 1980 Models During Their First Two Years, 1979 Models During Their First Three Years,* May 1982.

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April, 1983

Insurance Losses, Collision Coverages

A COMPARISON OF THE COLLISION LOSS EXPERIENCE OF SUBARU MODELS WITH 5 AND 2.5 MPH BUMPERS

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Insurance Losses, Collision Coverages

A COMPARISON OF THE COLLISION LOSS EXPERIENCE OF SUBARU MODELS WITH 5 AND 2.5 MPH BUMPERS

Research Report HLDI A-20
April 1983

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Summary

This report compares the collision coverage loss experience of 1981 and 1982 model year Subaru two-wheel drive cars with 5 mph bumpers and four-wheel drive cars with 2.5 mph bumpers. The 2.5 mph bumpers have been permitted because the four-wheel drive Subarus are classified as multi-purpose passenger vehicles and as such are not required to meet the federal bumper standards. In order to eliminate biases that might be introduced by different exposure patterns associated with the different vehicle drive systems, for a number of the comparisons, the cars compared were matched by garaging location. In others, separate results were obtained for winter and non-winter months.

Principal Findings:

- The 1981 and 1982 model year Subarus with 2.5 mph bumpers had substantially worse collision coverage loss experience than the corresponding models with 5 mph bumpers. The pattern of the results strongly suggests that the weaker bumpers, rather than drive system related factors, are responsible for much of the difference.

- The collision coverage claim frequencies for the cars with 2.5 mph bumpers were 18 to 57 percent greater than the frequencies for corresponding models with 5 mph bumpers.

- Differences in average loss payments ranged from -18 percent to +11 percent.

- Increases in average loss payments per insured vehicle year for the cars with 2.5 mph bumpers ranged from 29 percent to 31 percent.

- Collision coverage losses for the cars with 2.5 mph bumpers increased as deductible amounts decreased.

- In both winter and non-winter months the cars with 2.5 mph bumpers had worse loss experience than the cars with 5 mph bumpers.

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Introduction

The Highway Loss Data Institute (HLDI) is a nonprofit, public service organization that gathers, processes, and publishes insurance data concerning the human and economic losses associated with motor vehicles — especially the ways such losses vary among different kinds of vehicles.

Since the 1973 model year, all new passenger cars sold in the United States have been required to meet the minimum performance requirements of various federal bumper standards. The first such standard required that 1973 models sustain no damage to safety-related items — lights, turn signals, etc. — in 5 mph front and 2.5 mph rear barrier impact tests. Beginning with the 1974 model year, rear-end requirements were upgraded to 5 mph, and pendulum impact tests were added, principally to ensure uniform bumper heights among cars. With some variations in the pendulum test requirements, the 5 mph safety bumper standard was in effect through the 1978 model year.

Beginning with 1979 models, the safety bumper standard was superseded by the federal, no-damage bumper standard. In the first year of this standard, cars were required to sustain no damage except to bumpers and their attachment hardware in 5 mph front and rear barrier impacts. In the following year, the standard was upgraded, requiring cars to sustain no damage (except very minor cosmetic bumper damage) in 5 mph front and rear barrier impacts.

In mid-1982 the barrier impact test requirements of the federal, no-damage bumper standard were reduced from 5 to 2.5 mph. Damage to bumpers and their attachment hardware again was permitted. In justifying this rollback, the National Highway Traffic Safety Administration said that 2.5 mph bumpers would cost and weigh less than 5 mph bumpers, and that these savings would more than offset the increased damage that would result from weakened bumpers. The agency used theoretical projections (not field data) to estimate the magnitude of the increased repair costs that would result from weaker bumpers.

Since some cars with 2.5 mph bumpers had already been in use for some time, comparisons of the real-world loss experience of cars with 5 mph and 2.5 mph bumper performance levels can be made. Specifically, Subaru designated its four-wheel drive passenger cars as multi-purpose passenger vehicles (MPVs), which were not required to meet the federal bumper standard at any time. The bumpers on Subaru MPVs have been described by their manufacturer as having 2.5 mph performance. In contrast, Subaru's two-wheel drive passenger cars have been required to comply with all applicable federal bumper standards; and in recent model years have been equipped with 5 mph bumpers.

This report compares the collision coverage loss experience of 1981 and 1982 model year Subaru hatchbacks and station wagons with two-wheel drive and 5 mph bumpers to the experience of corresponding cars with four-wheel drive and 2.5 mph bumpers. (Appendix A describes these models.) Unlike other pairs of two- and four-wheel drive passenger vehicles (such as AMC's Spirit and Eagle), Subaru's two- and four-wheel drive vehicles are very similar; in particular their bumper heights are about the same and their curb weights are comparable. Furthermore, the ground clearance of the four-wheel drive Subarus is only slightly higher than that of the two-wheel drive models, suggesting that they are not likely to be frequently used in off-road situations. Thus, the comparisons of their real-world loss experience should primarily reflect differences in bumper performance levels instead of other design-related differences.

Since geographic differences in the distribution of the garaging locations of two- and four-wheel drive vehicles could influence their collision coverage loss experience, each four-wheel drive car was matched by garaging location to a two-wheel drive car of the same model. Cars were also matched by insurance deductible amounts and operator age group. In this way, the possible confounding effects of geography were eliminated. The exposure periods for the pairs of cars were only approximately matched; consequently, the total exposures for the compared sets of cars are not identical. (Details of the matching procedure are given in Appendix B.) Similarly, since the use patterns of two- and four-wheel drive cars could be different in winter and non-winter months, separate results were computed for the different calendar periods.

This report is based on collision coverage and loss data supplied by eleven insurers: Aetna, Allstate, GEICO, Kemper, Liberty Mutual, Nationwide, Prudential, Safeco, State Farm, Travelers, and USAA.

It is intended that the dissemination of this and other HLDI reports will contribute to research into ways for reducing vehicle-related damage to people and property, as well as provide the public with information illustrating variations in the insurance loss experience of different kinds of vehicles.

Results and Discussion

Matched Results

Table 1 summarizes the collision coverage results for three pairs of 1981 and 1982 Subaru models with 5 and 2.5 mph bumpers matched by garaging location, deductible amount, and driver age group. These results are standardized to the same mix of exposure by deductible amount and operator age group, to ensure that the three sets of comparisons are not influenced by different amounts of exposure for these non-vehicle factors. Standardization weights were derived from the mix of exposure for the six models studied and are somewhat different from the usual standardization weights used by HLDI. Non-standardized results are shown in Appendix C.

The effects of weaker bumpers on collision coverage loss experience should show up primarily as increases in claim frequencies because repair costs exceeding the deductible amounts are more often expected for crash-involved cars with 2.5 mph bumpers than for cars with 5 mph bumpers because low-speed impacts with weaker bumpers will more often result in increased damage. For each of the three pairs of models studied, the cars with the 2.5 mph bumpers had substantially higher — 18 to 57 percent higher — collision coverage claim frequency results than the corresponding models with 5 mph bumpers. Thus, the results strongly suggest that the weaker bumpers have an effect on the collision losses and that these differences to a large extent are due to the bumpers.

TABLE 1
Collision Coverages - Loss Payment Summary*
Subaru Models with 5 and 2.5 mph Bumpers Matched by Garaging Location, Deductible Amount and Driver Age Group

Model Year	Model	Drive Type	Bumper System (mph)	Total Exposure (Insured Vehicle Years)	Claim Frequency	Average Loss Payment Per Claim	Average Loss Payment Per Insured Vehicle Year
1981	Hatchback	2	5	2,126	10.3	$1317	$136
		4	2.5	2,050	12.2	$1463	$178
					Increase 18%	11%	31%
1981	Station Wagon	2	5	8,564	8.2	$1336	$109
		4	2.5	8,356	11.2	$1264	$141
					Increase 37%	-5%	29%
1982	Station Wagon	2	5	2,084	5.6	$1582	$ 88
		4	2.5	2,206	8.8	$1300	$114
					Increase 57%	-18%	30%

* Results are standardized to reflect the following distribution of exposure:

Deductible	Youthful Operator	No-Youthful Operator
∠ $150	4%	52%
⩾ $150	6%	38%

The bumper performance levels should not influence the average loss payments as much as the claim frequencies because the increased numbers of claims will generally be for small amounts, and some claim amounts are likely to decrease and others increase. Differences in the average loss payments per claim were much smaller than those for claim frequency — eleven percent higher, five percent lower, and eighteen percent lower — for cars with 2.5 mph bumpers, compared to corresponding models with 5 mph bumpers.

The most complete measure of the collision coverage loss experience of a particular model is the average loss payment per insured vehicle year. In all three comparisons, the cars with the 2.5 mph bumpers had substantially higher average loss payments per insured vehicle year than the corresponding models with 5 mph bumpers; these increases ranged from 29 to 31 percent.

Unmatched Results

It was not possible to match all of the Subaru models in the HLDI data files by garaging location, deductible amount, and operator age group. Consequently, the results shown in Table 1 do not reflect the total exposure available for these makes and models. Table 2 presents comparisons similar to those in Table 1, but in this case the results are based on all available HLDI data for these particular Subaru models.

The results of the comparisons in Table 2 are very similar to those in Table 1. In particular, there are substantial increases (21 to 46 percent) in the claim frequency results for the Subaru models with 2.5 mph bumpers, compared with the corresponding models with 5 mph bumpers. The similarity of these results to those in Table 1 suggests that differences in the distribution of garaging locations of Subarus with 5 mph and 2.5 mph bumpers do not substantially influence the collision coverage loss experience of these cars.

TABLE 2
Collision Coverages - Loss Payment Summary*
Subaru Models with 5 and 2.5 mph Bumpers

Model Year	Model	Drive Type	Bumper System (mph)	Total Exposure (Insured Vehicle Years)	Claim Frequency	Average Loss Payment Per Claim	Average Loss Payment Per Insured Vehicle Year
1981	Hatchback	2	5	9,113	9.8	$1403	$138
		4	2.5	3,326	11.9	$1502	$179
					Increase 21%	**7%**	**30%**
1981	Station Wagon	2	5	18,075	8.4	$1327	$111
		4	2.5	14,534	11.1	$1334	$148
					Increase 32%	**1%**	**33%**
1982	Station Wagon	2	5	4,692	6.3	$1454	$ 92
		4	2.5	4,193	9.2	$1295	$119
					Increase 46%	**-11%**	**29%**

* Results are standardized to reflect the following distribution of exposure:

Deductible	Youthful Operator	No-Youthful Operator
$< \$150$	4%	52%
$\geq \$150$	6%	38%

In two of the three comparisons of the average loss payments for the pairs of Subaru models, the results for the car with 2.5 mph bumpers was higher than for the corresponding model with 5 mph bumpers — in one case seven percent higher, in the other one percent higher. In the third comparison, the average loss payment per claim was eleven percent lower for the model with 2.5 mph bumpers. For all three pairs of cars the average loss payments per insured vehicle year were substantially higher for the Subarus with 2.5 mph bumpers than for the corresponding models with 5 mph bumpers; these increases ranged from 29 to 33 percent.

Losses By Deductible Amount

The 1981 Subaru station wagons have substantially more exposure than the other two Subaru models studied. This larger exposure base allowed more detailed comparisons for this model than for the other two. Table 3 expands the comparisons shown in Tables 1 and 2 for the 1981 Subaru station wagons. It shows results separately for collision coverages with deductible amounts less than $150 (predominantly $100) and $150 or more (predominantly $200). Comparisons are presented for both matched and unmatched data.

If the differences in claim frequency results are primarily attributable to differences in bumper performance, then greater reductions should occur for lower deductible coverages; this is because more of the crash damage to cars with 2.5 mph bumpers should exceed the lower deductible levels.

TABLE 3
Collision Coverages - Loss Payment Summary by Deductible Amount*
1981 Subaru Station Wagons with 5 and 2.5 mph Bumpers

Type of Results	Deductible Amount	Drive Type	Bumper System (mph)	Exposure (Insured Vehicle Years)	Claim Frequency	Average Loss Payment Per Claim	Average Loss Payment Per Insured Vehicle Year
Matched Results	∠ $150	2	5	5,252	8.9	$1,135	$101
		4	2.5	5,159	12.7	$1,129	$143
					Increase 43%	**-1%**	**42%**
	⩾ $150	2	5	3,312	7.3	$1,627	$119
		4	2.5	3,197	9.3	$1,438	$134
					Increase 27%	**-12%**	**13%**
Unmatched Results	∠ $150	2	5	10,405	9.2	$1,182	$109
		4	2.5	8,262	12.6	$1,174	$148
					Increase 37%	**-1%**	**36%**
	⩾ $150	2	5	7,670	7.3	$1,559	$114
		4	2.5	6,272	9.2	$1,589	$146
					Increase 26%	**2%**	**28%**

* Results are standardized to reflect 10 percent of the exposure from youthful operators and 90 percent from no-youthful operators.

The claim frequency increases for Subaru station wagons with 2.5 mph bumpers, compared to station wagons with 5 mph bumpers, were much greater at lower deductible amounts. This was true for both matched and unmatched comparisons. Specifically, for the lower deductible amounts the claim frequencies for station wagons with 2.5 mph bumpers were 43 percent and 37 percent higher (matched and unmatched results respectively) than for station wagons with 5 mph bumpers. For the larger deductibles, claim frequency results were 27 percent and 26 percent higher, for the matched and unmatched results respectively. The results in Table 3 provide further evidence that 2.5 mph bumpers are responsible for the increases in collision coverage losses.

In three out of the four comparisons shown in Table 3, the average loss payments per claim are about the same for 1981 station wagons with 5 mph and 2.5 mph bumpers. In the case of the matched results based on collision coverages with deductibles of $150 or more, the station wagons with 2.5 mph bumpers had an average loss payment per claim that was twelve percent lower than the corresponding result for the station wagons with 5 mph bumpers. In every comparison shown in Table 3, the average loss payments per insured vehicle year were substantially lower for the station wagons with 5 mph bumpers. These differences were greater for collision coverages with lower deductible amounts.

Losses By Operator Age Group

Table 4 shows results by operator age group for 1981 Subaru station wagons. There was insufficient exposure from the matched data to compute results for youthful operators. For the station wagons insured for use with no youthful operators, the cars with 2.5 mph bumpers had 35 percent higher claim frequency results than the cars with 5 mph bumpers. There were only minor differences in average loss payments per claim and there was a 38 percent increase in the average loss payments per insured vehicle year.

TABLE 4
Collision Coverages - Loss Payment Summary by Operator Age Group*
1981 Subaru Station Wagons with 5 and 2.5 mph Bumpers

Type of Results	Operator Age Group	Drive Type	Bumper System (mph)	Exposure (Insured Vehicle Years)	Claim Frequency	Average Loss Payment Per Claim	Average Loss Payment Per Insured Vehicle Year
Matched Results	Youthful	2	5	381	Insufficient Exposure		
		4	2.5	378			
	No-Youthful	2	5	8,183	7.9	$1,255	$ 99
		4	2.5	7,978	10.7	$1,278	$137
					Increase 35%	**2%**	**38%**
Unmatched Results	Youthful	2	5	1,184	14.1	$1,506	$212
		4	2.5	1,146	15.6	$1,560	$244
					Increase 11%	**4%**	**15%**
	No-Youthful	2	5	16,891	7.7	$1,291	$100
		4	2.5	13,388	10.6	$1,287	$137
					Increase 38%	**0%**	**37%**

* Results are standardized to reflect 56 percent of the exposure from deductibles less than $150 and 44 percent from deductibles greater than or equal to $150.

For the unmatched comparisons, the results for cars with youthful operators showed smaller differences between the cars with 5 mph and 2.5 mph bumpers — an increase of 11 percent in claim frequency, 4 percent in average loss payment amounts, and 15 percent in average loss payments per insured vehicle year. For the station wagons with no-youthful operators, the unmatched results were very similar to the matched comparisons.

Losses By Season

Since four-wheel drive cars may be driven more than two-wheel drive cars in winter months when collision losses are more frequent, results for the 1981 Subaru station wagons were computed separately for winter — December through March — and non-winter months. These results are shown in Table 5.

The claim frequency results were much higher for both groups of cars in the winter months; however, in both the winter and non-winter months the Subaru station wagons with 2.5 mph bumpers had much worse collision coverage loss experience than the wagons with 5 mph bumpers.

TABLE 5
Collision Coverages - Loss Payment Summary by Season*
1981 Subaru Station Wagons with 5 and 2.5 mph Bumpers

Type of Results	Season	Drive Type	Bumper System (mph)	Exposure (Insured Vehicle Years)	Claim Frequency	Average Loss Payment Per Claim	Average Loss Payment Per Insured Vehicle Year
	Dec-Mar	2	5	2394	10.9	1156	126
	Dec-Mar	4	2.5	2432	14.5	1095	159
Matched Results					**Increase 33%**	**-5%**	**26%**
	Apr-Nov	2	5	6171	7.1	1442	103
	Apr-Nov	4	2.5	5924	9.8	1369	134
					Increase 38%	**-5%**	**30%**
	Dec-Mar	2	5	5061	10.4	1209	126
	Dec-Mar	4	2.5	4255	15.5	1256	194
Unmatched Results					**Increase 49%**	**4%**	**54%**
	Apr-Nov	2	5	13020	7.5	1390	105
	Apr-Nov	4	2.5	10284	9.3	1389	129
					Increase 24%	**0%**	**23%**

*Results are standardized to reflect the following distribution of exposure:

Deductible	Youthful Operator	No-Youthful Operator
$< $150	4%	52%
$\geq $150	6%	38%

Appendix A
Vehicle Specifications

The specific models included in this report are the 1981 Subaru hatchback (Standard, DL, and GL models), the 1981 Subaru station wagon (DL and GL models), and the 1982 Subaru station wagon (DL and GL models).

Table A1 summarizes the vehicle specifications of the models included in this study. All of the models studied have four-wheel independent suspension with MacPherson Struts and coil springs in the front and torsion bar suspension in the rear. The cars are also equipped with rack and pinion steering. A dual diagonal braking system with power assist front disc brakes and power assist rear drum brakes is standard on all models.

Although the table shows that the Subaru models with 2.5 and 5 mph bumpers have similar physical dimensions, there are some minor differences in curb weight and ground clearance between the compared sets of vehicles. The vehicles are nearly identical in all other respects, including bumper heights, which only vary very slightly.

TABLE A1
VEHICLE SPECIFICATIONS OF 1981 AND 1982 SUBARU MODELS WITH 5 AND 2.5 MPH BUMPERS

MODEL YEAR	MODEL	DRIVE TYPE	BUMPER SYSTEM (MPH)	WHEELBASE (IN.)	OVERALL LENGTH (IN.)	OVERALL WIDTH (IN.)	OVERALL HEIGHT (IN.)	GROUND CLEARANCE (IN.)	ENGINE DISPLACEMENT (CC)	CURB WEIGHT (LBS.)
1981	HATCHBACK STD	2	5	93.7	156.9	63.4	53.7	6.5	1600	2000
	HATCHBACK	4	2.5	93.3	156.9	63.4	53.7	8.1	1800	2160
	HATCHBACK DL	2	5	93.7	156.9	63.4	53.7	6.5	1600	2025
	HATCHBACK DL	4	2.5	93.3	156.9	63.4	53.7	8.1	1800	2210
	HATCHBACK GL	2	5	93.7	156.9	63.4	53.7	6.5	1800	2100[1]
	HATCHBACK GL	4	2.5	93.3	156.9	63.4	53.7	8.1	1800	2215
1981	STATION WAGON DL	2	5	96.7	168.5	63.4	54.7	6.9	1800	2185[2]
	STATION WAGON DL	4	2.5	96.3	168.3	63.8	56.9	8.1	1800	2310
	STATION WAGON GL	2	5	96.7	169.3	63.8	54.7	6.9	1800	2220[3]
	STATION WAGON GL	4	2.5	96.3	168.3	63.8	56.9	8.1	1800	2325
1982	STATION WAGON DL	2	5	96.7	168.5	63.4	54.7	6.9	1800	2245
	STATION WAGON DL	4	2.5	96.3	168.3	63.8	56.9	8.1	1800	2375
	STATION WAGON GL	2	5	96.7	169.3	63.6	54.7	6.9	1800	2310
	STATION WAGON GL	4	2.5	96.3	168.3	63.8	56.9	8.1	1800	2410

FOOTNOTES FOR TABLE A1:

[1] THE 1981 SUBARU GL HATCHBACK WITH AN AUTOMATIC TRANSMISSION HAS A CURB WEIGHT OF 2130 POUNDS.
[2] THE 1981 SUBARU DL STATION WAGON WITH A FIVE-SPEED TRANSMISSION HAS A CURB WEIGHT OF 2190 POUNDS.
[3] THE 1981 SUBARU GL STATION WAGON WITH AN AUTOMATIC TRANSMISSION HAS A CURB WEIGHT OF 2265 POUNDS.

Appendix B
Vehicle Matching Procedure

Garaging locations in the HLDI data system are defined in one of two ways, either by five-digit ZIP codes or insurance state and territory codes.

For garaging locations defined by ZIP codes, each Subaru model with 2.5 mph bumpers was matched by five-digit ZIP code with the same make and series with 5 mph bumpers. These cars were then also matched by insurance deductible amounts and operator age group. If no match could be found for a five-digit ZIP, a match was attempted at a four-digit level. If a match could not be found at that level, a match of ZIP zones - defined as the aggregation of those ZIP codes with identical first three digits - was attempted. The areas encompassed by such aggregations of ZIP codes are always contiguous.

For insurance state and territory codes, vehicles with 2.5 mph bumpers were matched by make and series to vehicles with 5 mph bumpers on the basis of shared state and territory garaging locations. These vehicles were then matched by insurance deductible amounts and operator age group.

Over 50 percent of the vehicle matches used in this study were made at either the five-digit ZIP code level or the state and territory level, insuring that the compared sets of cars were garaged in similar geographic locations. The subsequent matching of these cars by deductible amounts and operator age group ensures that those two factors would not distort the comparison of loss results.

Appendix C
Detailed Results By Operator Age Group and Deductible Amount

TABLE C1

CLAIM FREQUENCY DETAILS BY OPERATOR AGE GROUP AND DEDUCTIBLE
SUBARU MODELS WITH 5 AND 2.5 MPH BUMPERS
MATCHED BY GARAGING LOCATION, DEDUCTIBLE AMOUNT, AND DRIVER AGE GROUP

				YOUTHFUL OPERATOR						NO YOUTHFUL OPERATOR						CLAIM FREQUENCY	
				<$150 DEDUCTIBLE			≥$150 DEDUCTIBLE			<$150 DEDUCTIBLE			≥$150 DEDUCTIBLE				
MODEL YEAR	MODEL	DRIVE TYPE	BUMPER SYSTEM (MPH)	EXPOSURE	CLAIMS	FREQ	EXPOSURE	CLAIMS	FREQ	EXPOSURE	CLAIMS	FREQ	EXPOSURE	CLAIMS	FREQ	COMB	STD
1981	HATCHBACK	2	5	113	28	24.9	170	15	8.8	1158	120	10.4	686	61	8.9	10.5	10.3
		4	2.5	107	14	13.1	151	25	16.6	1107	139	12.6	686	74	10.8	12.2	12.2
1981	STATION WAGON	2	5	185	21	11.4	196	20	10.2	5067	437	8.6	3116	216	6.9	8.1	8.2
		4	2.5	173	32	18.5	205	25	12.2	4986	601	12.1	2992	270	9.0	11.1	11.2
1982	STATION WAGON	2	5	31	3	9.6	45	5	11.1	1225	74	6.0	783	28	3.6	5.3	5.6
		4	2.5	37	7	19.1	48	2	4.2	1306	130	10.0	815	55	6.7	8.8	8.8

TABLE C2

CLAIM FREQUENCY DETAILS BY OPERATOR AGE GROUP AND DEDUCTIBLE
SUBARU MODELS WITH 5 AND 2.5 MPH BUMPERS

				YOUTHFUL OPERATOR						NO YOUTHFUL OPERATOR						CLAIM FREQUENCY	
				<$150 DEDUCTIBLE			≥$150 DEDUCTIBLE			<$150 DEDUCTIBLE			≥$150 DEDUCTIBLE				
MODEL YEAR	MODEL	DRIVE TYPE	BUMPER SYSTEM (MPH)	EXPOSURE	CLAIMS	FREQ	EXPOSURE	CLAIMS	FREQ	EXPOSURE	CLAIMS	FREQ	EXPOSURE	CLAIMS	FREQ	COMB	STD
1981	HATCHBACK	2	5	767	130	17.0	987	117	11.9	4207	429	10.2	3153	261	8.3	10.3	9.8
		4	2.5	209	27	12.9	332	55	16.5	1614	198	12.3	1171	124	10.6	12.1	11.9
1981	STATION WAGON	2	5	532	83	15.6	652	79	12.1	9873	840	8.5	7018	476	6.8	8.2	8.4
		4	2.5	461	81	17.6	684	90	13.2	7800	942	12.1	5587	490	8.8	11.0	11.1
1982	STATION WAGON	2	5	120	10	8.3	182	17	9.3	2286	145	6.3	2104	119	5.7	6.2	6.3
		4	2.5	130	19	14.6	209	24	11.5	2099	212	10.1	1755	122	7.0	9.0	9.4

TABLE C3

AVERAGE LOSS PAYMENT DETAILS BY OPERATOR AGE GROUP AND DEDUCTIBLE
SUBARU MODELS WITH 5 AND 2.5 MPH BUMPERS
MATCHED BY GARAGING LOCATION, DEDUCTIBLE AMOUNT, AND OPERATOR AGE GROUP

				YOUTHFUL OPERATOR				NO YOUTHFUL OPERATOR				AVERAGE LOSS PAYMENT	
				<$150 DEDUCTIBLE		≥$150 DEDUCTIBLE		<$150 DEDUCTIBLE		≥$150 DEDUCTIBLE			
MODEL YEAR	MODEL	DRIVE TYPE	BUMPER SYSTEM (MPH)	PAID CLAIMS	AVERAGE LOSS	PAID CLAIMS	AVERAGE LOSS	PAID CLAIMS	AVERAGE LOSS	PAID CLAIMS	AVERAGE LOSS	COMB	STD
1981	HATCHBACK	2	5	28	$979	15	$1717	120	$1302	61	$1377	$1310	$1317
		4	2.5	14	1378	25	1845	139	1286	74	1664	1457	1463
1981	STATION WAGON	2	5	21	1461	20	2276	437	1087	216	1521	1268	1336
		4	2.5	32	645	25	1751	601	1211	270	1391	1259	1264
1982	STATION WAGON	2	5	3	1445	5	3766	74	1116	28	1626	1375	1582
		4	2.5	7	1740	2	1224	130	1005	55	1772	1251	1300

TABLE C4

AVERAGE LOSS PAYMENT DETAILS BY OPERATOR AGE GROUP AND DEDUCTIBLE
SUBARU MODELS WITH 5 AND 2.5 MPH BUMPERS

				YOUTHFUL OPERATOR				NO YOUTHFUL OPERATOR				AVERAGE LOSS PAYMENT	
				<$150 DEDUCTIBLE		≥$150 DEDUCTIBLE		<$150 DEDUCTIBLE		≥$150 DEDUCTIBLE			
MODEL YEAR	MODEL	DRIVE TYPE	BUMPER SYSTEM (MPH)	PAID CLAIMS	AVERAGE LOSS	PAID CLAIMS	AVERAGE LOSS	PAID CLAIMS	AVERAGE LOSS	PAID CLAIMS	AVERAGE LOSS	COMB	STD
1981	HATCHBACK	2	5	130	$1249	117	$1758	429	$1316	261	$1502	$1414	$1403
		4	2.5	27	1809	55	1899	198	1392	124	1539	1534	1502
1981	STATION WAGON	2	5	83	1400	79	1681	840	1137	476	1535	1309	1327
		4	2.5	81	1285	90	2027	942	1157	490	1516	1322	1334
1982	STATION WAGON	2	5	10	1567	17	1787	145	1190	119	1755	1469	1454
		4	2.5	19	1400	24	1554	212	1073	122	1645	1305	1295

Appendix D
Definitions

Average Loss Payment per Claim — The total of all loss payments made for the claims for a group of vehicles, divided by the number of claims paid; expressed as dollars per claim.

Average Loss Payment per Insured Vehicle Year — For a group of vehicles, the product of Claim Frequency and Average Loss Payment per Claim, divided by 100; expressed as dollars per insured vehicle year. It should be noted that this definition differs from the commonly used insurance term, pure premium, but yields similar results.

Claim Frequency — The number of claims for a group of vehicles, divided by the exposure for that group; expressed as claims per one hundred insured vehicle years.

Collision Coverages — As defined in insurance contracts, the coverage under which people insure their own vehicle against loss caused by collision.

Deductible Amount — That portion of the collision damage cost borne by the policyholder. For computing results, deductible amounts are split into two groups; less than $150 (mainly $50 and $100 deductibles) and greater than or equal to $150 (mainly $200 and $250 deductibles).

Exposure — The time interval an individual vehicle is insured. Exposure for a group of vehicles is expressed in units of insured vehicle years.

Loss Payment — That portion of the collision damage cost borne by the insurer; in general, the total collision damage cost minus the deductible amount.

Operator Age Group — The factor which distinguishes those vehicles whose rated driver is youthful from those vehicles whose rated driver is not youthful (see *Youthful Operator*).

Rated Driver — The driver who, for insurance purposes, is considered to represent the greatest loss potential for the insured vehicle.

Vehicle Identification Number (VIN) — A code, variously comprising both numbers and letters; normally, 8 to 17 characters in length, assigned to each vehicle by its manufacturer. The VIN uniquely identifies the vehicle within at least a ten-year time span and, in recent model year vehicles, contains coding which identifies the make, series, model year, and other characteristics of each vehicle.

Vehicle Series — A name denoting a family of vehicles, within a make, with the same wheelbase and a degree of commonality in construction such as body, chassis, etc.

Youthful Operator — For the purposes of this report, all males (married or single) under 25 years of age and all unmarried females under 25 years of age.

List of Publications

Research reports published by the Highway Loss Data Institute are:

R72-1 *Automobile Insurance Losses, Collision Coverages; Variations by Make and Series, 1972 Models*, June 1973.

R73-1 *Automobile Insurance Losses, Collision Coverages; Initial Results for 1973 Models Compared with 1972 Models*, September 1973.

R73-2 *Automobile Insurance Losses, Collision Coverages; Variations by Make and Series, 1973 Models*, March 1974.

R73-3 *Automobile Insurance Losses, Collision Coverages; Variations by Make and Series, 1973 Models During Their First Two years*, December 1974.

R73-4 *Automobile Insurance Losses, Collision Coverages; Variations by Make and Series, 1973 Models During Their First Three Years*, December 1975.

R74-1 *Automobile Insurance Losses, Collision Coverages; Initial Results for 1974 Models*, May 1974.

R74-2 *Automobile Insurance Losses, Collision Coverages; Variations by Make and Series, 1974 Models During Their First Year*, December 1974.

R74-3 *Automobile Insurance Losses, Collision Coverages; Variations by Make and Series, 1974 Models During Their First Two Years*, December 1975.

R75-1 *Automobile Insurance Losses, Collision Coverages, Initial Results for 1975 Models*, July 1975.

R75-2 *Automobile Insurance Losses, Collision Coverages; Variations by Make and Series, 1975 Models During Their First Year*, December 1975.

R76-1 *Automobile Insurance Losses, Collision Coverages; Initial Results for 1976 Models*, June 1976.

R76-2 *Automobile Insurance Losses, Collision Coverages; Variations by Make and Series, 1976 Models During Their First Year, 1975 Models During Their First Two Years, 1974 Models During Their First Three Years*, December 1976.

R77-1 *Automobile Insurance Losses, Collision Coverages; Initial Results for 1977 Models*, June 1977.

R77-2 *Automobile Insurance Losses, Collision Coverages; Variations by Make and Series, 1977 Models During Their First Year, 1976 Models During Their First Two Years, 1975 Models During Their First Three Years*, December 1977.

R78-1 *Automobile Insurance Losses, Collision Coverages; Initial Results for 1978 Models*, June 1978.

R78-2 *Automobile Insurance Losses, Collision Coverages; Variations by Make and Series, 1978 Models During Their First Year, 1977 Models During Their First Two Years, 1976 Models During Their First Three Years*, January 1979.

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R79-2 *Automobile Insurance Losses, Collision Coverages; Variations by Make and Series, 1979 Models During Their First Year, 1978 Models During Their First Two Years, 1977 Models During Their First Three Years*, December 1979.

R80-1 *Automobile Insurance Losses, Collision Coverages; Initial Results for 1980 Models*, June 1980.

R80-2 *Automobile Insurance Losses, Collision Coverages; Variations by Make and Series, 1980 Models During Their First Year, 1979 Models During Their First Two Years, 1978 Models During Their First Three Years*, December 1980.

R81-1 *Automobile Insurance Losses, Collision Coverages; Initial Results for 1981 Models*, July 1981.

R81-2 *Insurance Losses, Collision Coverages; Passenger Cars, Vans, Pickups, and Utility Vehicles; 1981 Models During Their First Year, 1980 Models During Their First Two Years, 1979 Models During Their First Three Years*, December 1981.

R82-1 *Automobile Insurance Losses, Collision Coverages; Initial Results for 1982 Models*, July 1982.

R82-2 *Insurance Losses, Collision Coverages; Passenger Cars, Vans, Pickups, and Utility Vehicles; 1982 Models During Their First Year, 1981 Models During Their First Two Years; 1980 Models During Their First Three Years*, December 1982.

V78-1 *Automobile Insurance Losses, Non-Commercial Collision Coverages; Variations by Make and Series, Vans, Pickups and Utility Vehicles; 1978 Models During Their First Year, 1977 Models During Their First Two Years*, February 1979.

V79-1 *Automobile Insurance Losses, Non-Commercial Collisions Coverages; Variations by Make and Series, Vans, Pickups and Utility Vehicles; 1979 Models During Their First Year, 1978 Models During Their First Two years*, April 1980.

V79-2 *Automobile Insurance Losses, Personal Injury Protection Coverages; Claim Frequency Results by Size of Claim for 1977, 1978, and 1979 Vans, Pickup Trucks, and Utility Vehicles,* October 1980.

V79-3 *Insurance Theft Losses; Vans, Pickups, and Utility Vehicles, 1979 Models,* May 1981.

V80-1 *Automobile Insurance Losses, Non-Commercial Collision Coverages; Variations by Make and Series, Vans, Pickups, and Utility Vehicles; 1980 Models During Their First Year, 1979 Models During Their First Two Years, 1978 Models During Their First Three Years,* December 1980.

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I75-1 *Automobile Insurance Losses, Injury Coverages; Claim Frequency Results for 1974 and 1975 Models,* June 1976.

I75-2 *Automobile Insurance Losses, Percentage of Collision Claims with Associated Injury Claims for 1974 and 1975 Models,* March 1977.

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I76-2 *Automobile Insurance Losses, Injury Coverages; Claim Frequency Results for 1974, 1975, and 1976 Models,* September 1978.

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I78-1 *Automobile Insurance Losses, Personal Injury Protection Coverages; Claim Frequency Results for 1977 and 1978 Models,* September 1979.

I79-1 *Automobile Insurance Losses, Personal Injury Protection Coverages; Claim Frequency Results by Size of Claim for 1977, 1978, and 1979 Models,* October 1980.

I80-1 *Automobile Insurance Losses, Personal Injury Protection Coverages; Claim Frequency Results by Size of Claim; 1978-1980 Models,* September 1981.

I81-1 *Insurance Losses, Personal Injury Protection Coverages; Passenger Cars, Vans, Pickups, and Utility Vehicles,* September 1982.

A-1 *Automobile Insurance Losses, Collision Coverages; A Comparison of Results for 1972 and 1973 Models,* May 1974.

A-2 *Automobile Insurance Losses, Collision Coverages; Relationships Between Losses and Vehicle Density, 1972 and 1973 Models,* September 1974.

A-3 *Automobile Insurance Losses, Collision Coverages; A Comparison of Results for 1973, 1974 and 1975 Models,* July 1975.

A-4 *Automobile Insurance Losses, Collision Coverages; Relationships Between Losses and Vehicle Density, 1974 and 1975 Models,* December 1975.

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A-6 *Automobile Insurance Losses, Collision Coverages; An Investigation of Relationships Between Losses and Engine Specifications, Using 1973 Models,* June 1976.

A-7 *Automobile Insurance Losses, Collision Coverages; Annual Increases and Seasonal Variations 1972, 1973, 1974 and 1975 Models,* June 1976.

A-8 *Automobile Insurance Losses, Injury Coverages; A Preliminary Comparison of Results for Volkswagen Rabbits with Passive and Active Seat Belts, 1975 and 1976 Models,* June 1977.

A-9 *Automobile Insurance Losses, Collision Coverages; A Comparison of Collision Claim Size Distributions for 1974, 1975, and 1976 Models,* November 1977.

A-10 *Automobile Insurance Losses, Injury Coverages; Comparisons of Claim Frequencies of Volkswagen Rabbits with Automatic and Manual Seat Belts, 1975, 1976, and 1977 Models,* June 1979.

A-11 *Automobile Insurance Losses, Collision Coverages; The Consistency of the Loss Experience of Specific Vehicles Produced in Several Years, 1975 to 1978 Models,* June 1979.

A-12 *Automobile Insurance Losses, Collision Coverages; An Assessment of the Effects of the Federal Safety Bumper Standard on the Losses for 1972 Through 1978 Models,* June 1980.

A-13 *Automobile Insurance Losses, Personal Injury Protection and Collision Coverages; The Effects of Car Size on Crash Losses, 1977-1980 Models,* May 1981.

A-14 *Automobile Insurance Losses, Personal Injury Protection and Collision Coverages; Comparisons of the Loss Experience of Two- and Four-Door Cars, 1978, 1979, and 1980 Models,* June 1981.

A-15 *Automobile Insurance Losses, Personal Injury Protection and Collision Coverages; Relationships Between Injury and Collision Losses and Engine Options for Selected 1977-1979 Compact Cars,* June 1981.

A-16 *Automobile Insurance Losses, Collision Coverages; The Frequency of Claims Involving Salvage; Subcompact and Compact Cars; 1980 Models,* January 1982.

A-17 *Insurance Losses, Comprehensive Coverages; Non-Crash Fire Losses; 1979-1980 Models,* February 1982.

A-18 *Insurance Losses, Theft Coverages; The Distribution of Theft Loss Payment Amounts; Passenger Cars, Vans Pickups, and Utility Vehicles; 1981 Models During Their First Year, 1980 Models During Their First Two Years; 1979 Models During Their First Three Years,* June 1982.

A-19 *Insurance Losses, Theft Coverages; A Comparison of the Theft Loss Experience of General Motors Passenger Cars With and Without Factory-Installed Theft Deterrent Systems; 1980-1981 Models,* January 1983.

A-20 *Insurance Losses, Collision Coverages, A Comparison of the Collision Loss Experience of Subaru Models with 5 and 2.5 MPH Bumpers* April 1983.

T79-1 *Automobile Insurance Theft Losses by Make and Series; 1979 Models,* June 1980.

T80-1 *Automobile Insurance Theft Losses by Make and Series; 1979 and 1980 Models,* April 1981.

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